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THE ALBERTA AGRICULTURE RESEARCH TRUST • 1982-1983

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ANNUAL REPORT

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ANNUAL REPORT

Chairman's Report

To people both in and outside of agriculture, Alberta's primary and secondary food production sectors represent a crucial link in Alberta's economy. The stability these sectors provide and the potential they offer present Albertans with continued growth and a type of economic safety net that is always present to bolster the economy.

Within this context, the Alberta Agricultural Research Trust (AART) continued in 1982-83 to offer the province's agricultural sector the promise of the new technology so crucial to its future.

Historically, Alberta's agriculture sector has always required injections of new technology to push the industry into new periods of growth. This aspect of the industry is even more critical today with the ever-present demand on producers and processors to meet the requirements of an increasingly competitive market.

It was in answer to this concern that the Alberta Agricultural Research Trust was created in 1966. Its objective then, as it is today, was to provide agriculture with the information and innovation necessary to meet the demands of tomorrow.

Throughout its history the AART has supported research undertaken by private industry, farm organizations, government and university. In recent years the majority of the Trust's support has gone to university researchers, an important, ongoing source of new technology for Canadian agriculture. To them has fallen the task of helping to meet the producer's need to diversify, to incorporate existing knowledge into current production and to generate new technology to fuel advances.

Helping the researcher is the task of the AART. It is a job which the AART's Board of Trustees has approached from two different perspectives.

In the first instance, using the resources provided by industry and government, the Research Trust offers 100 percent funding each year to a number of new and ongoing projects.

In addition, the Trust attempts to encourage research endeavours that do not yet have the opportunity for direct support from within the industry. In support of this initiative the Board reserves a portion of each year's funding for projects that are not able to obtain financial support from the private sector.

Both funding methods have been used since the fund was established in 1966. A $500,000 grant from Alberta Agriculture provided the Trust's first funding support, with the Department granting the Trust an additional $250,000 each year to continue its support efforts. Of this amount, 80 percent is specifically targeted to projects that have direct industry support. Funding to these cooperative projects is usually matched on a one-for-one basis.

In 1982-83, the Alberta Agricultural Research Trust supported 27 projects worth more than $356,000. This total includes funding supplied by those cooperating in private sector projects. Since the Trust's inception, its total research effort has risen to almost 360 projects worth more than $5.65 million.

While the Board arrives at decisions through a number of operating guidelines, one guideline, above all, is crucial — that all research supported by the AART be relevant to Alberta's agricultural industry. In this regard, the Board feels its efforts have continued to be successful.

On behalf of the Board of Trustees of the Alberta Agricultural Research Trust, I extend our appreciation to the participating research scientists, the Grants Committee and to those organizations and businesses which have continued to provide financial support to agricultural research activities in Alberta.

H.B. McEwen
Chairman, Board of Trustees

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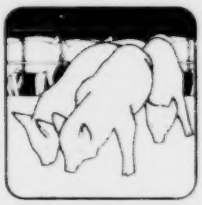


ANIMAL SCIENCE

AHERNE, F.X., P.E. KRUSE, L. ROTH, H.E. NIELSEN

Effect of dietary antibiotics on residues in colostrum and milk from sows and on baby pig performance

Three groups of ten sows were all fed a typical sow ration based on barley and soybean meal. From two weeks prior to expected parturition and one week after the sows' feed was supplemented with 2g of chlortetracycline or 2g of zincbacetracine per day in groups 2 and 3, respectively. Group 1 acted as control.

The strategic use of high doses of chlortetracycline or zincbacetracine for sows, to clean out the system of the sows at parturition, has not in this experiment shown any beneficial effect on the reproductive performance of the sows and on the viability and growth rate of the piglets. A high level of resistance was present in the E. coli isolates from half of the sows, although the sows had not been exposed to the antibiotics used in this experiment for several years. Fecal samples taken during farrowing showed moderate to heavy concentrations of E. coli. However, fecal samples from the same sows two weeks after farrowing generally showed remarkably fewer E. coli organisms irrespective of treatment. The frequency of K88 antigen producing E. coli colonies 2 weeks after farrowing were highest in fecal samples from control sows.

The residue levels of chlortetracycline were low and near the detection levels (0.01 ug/ml) in only very few colostrum and milk samples from sows in Group 2.

AHERNE, F.X., T.S. YANG, Z.J. HAWRYSH, M.A. PRICE

Effect of dantrolene sodium on pork quality from pigs stunned by captive-bolt

Quality characteristics of longissimus, semitendinosus and biceps femoris muscles of pigs treated with dantrolene sodium and stunned by captive-bolt were determined. The results were compared to those from untreated pigs stunned by electrical shock or captive-bolt. The three different muscles, although showing significant differences in some quality traits, responded similarly to drug treatment and stunning method. In untreated pigs captive-bolt stunning resulted in reduced muscle pH value at 45 minutes post-mortem and a greater water exudation in muscle at either one hour or 24 hour post-mortem when compared to electrical stunning. Dantrolene treatment followed by captive-bolt stunning eliminated these differences.

AHERNE, F.X., T.S. YANG, M.A. PRICE

The effect of level of feeding on water turnover in growing pigs

Water turnover was measured by tritium dilution in three groups of eight growing pigs receiving different amounts of the same diet for nine weeks. Control pigs (ration R1) were fed 47 g/kg body weight initially (about ten weeks of age, 27.8 kg liveweight), gradually reducing to 34 g/kg at the end of the experiment (about 19 weeks of age, 68.6 kg). During the same time period a second group of pigs were fed ration R2 consisting of 42 g/kg initially (28.7 kg liveweight) reducing to 30 g/kg (68.2 kg); and third group received R3 consisting of 39 g/kg (30.6 kg) reducing to 25 g/kg (59.0 kg). There was no significant difference in overall efficiency of feed conversion among pigs fed the three levels of feed although daily weight gain for the R2 and R3 pigs was significantly lower than that of the control pigs (R1). Water turnover rates (ml/kg and ml/kg$^{.82}$) for R1 and R2 pigs were similar in value and also in pattern which tended to decrease throughout the study. R3 pigs showed a continuous increase in turnover rate suggesting the gradual development of an overdrinking (polydipsia) behaviour. The extra water intake was not for homeostasis but was probably motivated by hunger. It was found that the pigs overdrank water when the daily dry matter feed intake decreased below 30 g/kg body weight.

AHERNE, F.X., T.S. YANG, Z.J. HAWRYSH, M.A. PRICE

Identification of PSE in the longissimus muscle of pigs stunned by captive-bolt

Meat quality in the longissimus dorsi muscle of pigs fed three diets based on soybean or on a high or low glucosinolate rapeseed meal was studied. Pigs were slaughtered by captive-bolt stunning and exsanguination as they reached 100 kg liveweight. The incidence of pale, soft and exudative (PSE) meat was identified by muscle color and water holding capacity 24 hour post-mortem. The muscle pH value 45 minute post mortem, absorption ratio of muscle acid extract, color and water holding capacity one hour post-mortem were also recorded. There were no significant differences attributable to any of the dietary treatments for any of the quality characteristics. Of the samples studied 21% were classified as normal; the rest were either pale (12%) or exudative (21%) or both (46%). Muscle pH value could effectively predict color and water holding capacity at one hour but not at 24 hour post-mortem.

KENNELLY, J.J.

Full-fat canola seed for lactating dairy cows and steers

Energy is generally the most limiting factor in the diet of high producing dairy cows. While protected lipids can make an important contribution to meeting the energy needs of the cow, the high price associated with the product precludes its use in most dairy operations. Because whole canola seed (WCS) contains approximately 40% fat there is a growing interest among producers in the use of WCS as a source of both protein and energy in the diet of lactating cows.

The objectives of the present study, therefore, were to deterimine the influence of WCS feeding on milk yield, milk composition and digestibility coefficients in lactating cows.

The results indicate that inclusion of WCS at levels in excess of approximately 8% of the concentrate mixture, causes reduced feed intake, lower milk production and interferes with microbial fermentation in the rumen. The fatty acid composition of milk from cows fed WCS was significantly different to that observed for cows fed the control diet. Feeding WCS reduced the level of short chain fatty acids and increased the proportion of 18:0 and 18:1 in milk fat.

SAUER, W.C

Evaluation of high lysine barley in pig starter diets

Chemical analysis for protein and amino acid content and biological assays with pigs and rats for determining amino acid digestibility, relative protein value and nitrogen balance data were conducted on high lysine barley test lines that were supplied by Alberta Agriculture.*

High lysine barley lines were identified following analysis for protein and amino acids. Chemical score calculations, based on the National Research Council estimates for amino acid requirements (NCR 1979), showed that one of the lines provided all the amino acids, including lysine, for 60-100 kg pigs.

Other lines, although not supplying all the required lysine to 60-100 kg pigs, contained significantly higher levels than the control (GALT) resulting in a significant improvement of 31 and 15 percentage units in nitrogen retention and biological value, respectively for one of the lines.

The results from these studies demonstrate the superior nutritional value of high lysine barley. The need for inclusion of expensive protein supplements in diets for pigs will be reduced, resulting in lowered feed costs, when high lysine barleys become commercially available.

* Dr. J. Helm (Barley geneticist, Alberta Agriculture, Lacombe)

FOOD SCIENCE

JACKSON, H., I. CHUNG

A study of the levels of vitamins A & D in milk and dairy products

The effects of pasteurization and UHT treatments, packaging materials, fluorescent light exposure and storage on the stability of vitamin A in fluid milk products were assessed. The findings are summarized below:

(1) No adverse effects on the vitamin A levels of fluid milk products resulted from either the pasteurization or the UHT treatments.

(2) Little or no vitamin A degradation was observed in opened cartons of the pasteurized milk products (2% partially skimmed, 2% chocolate and skimmed milk) throughout the products' coded shelf life (12 days); the results were not influenced by such factors as the carton size or the type of product.

(3) Under current fluorescent lighting conditions in retail display cases, the protection afforded by the paperboard cartons, regardless of color designs, on the vitamin A in fluid milk products was highly satisfactory. Photo-degradation of vitamin A, however, was very significant in milks packaged in clear plastic pouches, except when provided with an overwrap which could effectively block out light rays in the critical wavelength region. The natural vitamin A (found in unfortified Homo milk) was less sensitive to fluorescent light than the artificial form used in fortification.

(4) UHT milks may be stored in the 250-ml or one-litre cartons for at least 20 weeks at room temperature or 12 weeks at elevated temperature storage (35 degrees Celsius) with no significant changes in the vitamin A content or other quality attributes.

LEMAGUER, M.

Aqueous food freezants

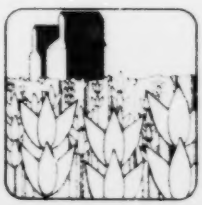
Solutions of water-ethanol-salt/or sucrose were studied to determine their ability to simultaneously cool and dehydrate food material of plant origin (carrots, potatoes . . .). Heat transfer properties (enthalpy, heat capacity, thermal conductivity, freezing point), transport properties (viscosity) and mass transfer properties (density, diffusivity) necessary for engineering calculations were measured. Tables, charts and correlations of the above properties as a function of compositions and temperature are available. These properties were used to develop a preliminary model for a suitable equipment to carry out the processing of carrots. The aqueous freezant is used to cool and dehydrate the carrots which are then packaged and blast frozen. A small scale column was used to determine appropriate values of the process parameters (flow rate, temperature). Preliminary energy consumption estimates were also obtained in order to evaluate the project from an economic point of view. Results show good potential in terms of product quality and economics.

SPORNS, P.

Analysis of the bee repellent, phenol, in honey

Use of the bee repellent, phenol (carbolic acid), with a phenol board (acid board) in collecting honey results in residues of phenol which are impossible to remove without adversely affecting the honey flavor. In Alberta, the use of phenol seems to be the preferred method of honey collection (over other bee repellents or alternate methods) with about 60% of honey samples in Alberta containing residual phenol at levels of 1 to 11.1 parts per million (ppm), averaging 7.4 ppm. Phenol residues were also found in honey samples from other provinces in Canada, the United States and Mexico. Although the unpleasant medicinal taste of phenol in water was detected at levels of about two ppm, phenol in honey was not detected by untrained panelists until levels were about ten times as high.

Beekeepers can limit, but not eliminate, phenol residues in honey by minimizing hive exposure to the phenol board and collecting a higher proportion of capped honey. Phenol accumulation in the wax of reused honey frames results in migration of phenol to new honey. If a bee-keeper discontinues the use of phenol, residue levels appear to decrease to trace levels (<0.5 ppm) within a year or less.



PLANT SCIENCE

KONDRA, Z.P., G.R. KASA

Crop growth analysis of rapeseed (Brassica napus L., summer-type, and B. campestris L., summer-type)

A quantitative analysis of the growth, development and yield of three genotypes of *B. napus L.* in 1979, and eight genotypes of *B. napus L.* and two genotypes of *B. campestris L.* in 1980, was conducted to provide plant breeding criteria and information on agronomic aspects. Genotypes of *B. campestris L.* reached all growth stages except onset of stem elongation earlier than genotypes of *B. napus L.* and had higher leaf emergence rates during all growth periods. *B. napus L.* had greater seed yield and crop dry weight than *B. campestris L.*, but lower crop efficiency. Earlier maturing genotypes of *B. napus L.* had greater mean leaf area ratios, axillary branch leaf area durations, and mean relative growth rates (RGRs) than late maturing genotypes. Existing breeding programs, in selecting earlier maturing, higher yielding genotypes, are also obtaining genotypes that have an increasing percentage of total leaf area made up from axillary branch leaves. The usefulness of RGR as a selection tool in breeding programs warrants further study.

RURAL ECONOMY

MURRI, D.

A study of user characteristics and attitudes toward home and garden pesticide products

Information about the amateur pesticide user was obtained by means of a telephone survey. The data provided information on who uses home and garden pesticides and their socioeconomic and demographic characteristics.

Information was also obtained on how these home and garden pesticide products are used, and how they are perceived by the amateur user. The experience these users have with the products, including handling, storage, and perceptions of labelling and instructions was also obtained.

PETERSEN, T.A.

Development of a farm management simulation model for teaching and research

The original objectives of this project have now essentially been completed. The project was originally set up to develop a farm business simulation computerized model which could be used for teaching and to a lesser extent farm business research. Cooperative work between the Department of Rural Economy of the University of Alberta, and the Farm Management Branch of Alberta Agriculture, resulted in a computerized simulation called ALTASIM. It has been used extensively over the past several years to train students, farmers, and agricultural staff in farm management, as well as for a number of research projects in farm business organization.

VEEMAN, T.S., M.M. VEEMAN

Input use, productivity, and the cost-price squeeze in prairie agriculture

The degree of input substitution and the extent of productivity growth for the agricultural sector in western Canada were analyzed and empirically measured. In the study of input substitution, four modifications of the translog cost function were estimated, using time series data for 1961 through 1978 and using five major input categories (land, labor, machinery, fertilizer, and energy). Elasticities of substitution between input pairs, own-price and cross-price elasticities of input demand, and indications of the direction of technical change were generated. The major empirical findings include: the presence of considerable factor substitution (though complementarity prevails for such input pairs as land/labor and fertilizer/energy); no decline in capital (machinery) for labor substitution after the so-called "energy crisis" began in 1973; the rejection of the Cobb-Douglas specification; the simultaneous presence of land-augmenting and labor-augmenting technical change; and the existence of inelastic demand for most farm inputs.

In the study of agricultural productivity in western Canada, improved flexible-weight (Divisia-related) indexing procedures were used to estimate aggregate output, aggregate input use, and total factor productivity. Between 1962 and 1978, aggregate output in western Canada increased annually by 2.2 percent, aggregate input by 0.8 percent, and total factor productivity (the ratio of aggregate output to all inputs) by 1.4 percent. Over the same period, the terms of trade (the ratio of the weighted price of aggregate output divided by the weighted price of aggregate input — which gives a measure of the "cost-price squeeze") faced by prairie producers declined by some 1.6 percent per year. When corrected for productivity advance, the economic position of farmers based solely on income from farm sources — as reflected in the ratio of farm returns to costs — decreased slightly by 0.2 percent per year.

SOIL SCIENCE

CROWN, P., D.H. PETERS

An assessment of the deep plowing potential of solonetzic soils in the Leduc area, Alberta

The physical and chemical nature of Solonetzic soils inhibits production of agriculture crops. Within the province of Alberta these soils have an areal extent of approximately five million hectares. Numerous methods to ameliorate Solonetzic soils have been tried. This study was initiated to develop a set of criteria that would act as guidelines for the assessment of the suitability of Solonetzic soil landscapes for amelioration by deep plowing. These assessment guidelines were tested on soil units mapped in a study area near Leduc, Alberta. This area includes both Solonetzic and non-Solonetzic soils.

The soils units within the study area were characterized according to physical, chemical and soil landscape properties including internal soil drainage and soil texture, the calcium content in the C horizon and the Ca/Na ratio in the surface horizon and the distribution of different soils within a portion of the landscape respectively. The soil units were assigned a possible non- to slight, moderate, moderate to severe or severe degree of limitation to deep plowing based on these properties and the assessment guidelines.

All soil units of the study area were considered as having a moderate to severe or severe degree of limitation. This was due to the chemical criteria used and the complexity of the soil landscape at this scale of mapping.

NYBORG, M.

Inhibitors of nitrification

Previous work indicated that losses from nitrogen fertilizer when applied in the fall were reduced more by using "nest" or big pellet application than by inhibitors of nitrification. All these techniques slow the formation of the ammonium in fertilizer into nitrate. It is only with the nitrate that there are losses of nitrogen during the late winter or early spring. The "nest" technique is mechanical and the fertilizer granules are put into small neat groups in the soil (weighing one to three grams). An alternate to the "nest" technique was using single big pellets each weighing one to three grams. The inhibitors of nitrification are chemicals which stop the soil bacteria which form nitrate. There are many effective inhibitors of nitrification which have been uncovered by researchers in other countries over the years.

The present work verified our previous work that placement of "nests" or big pellets was more effective than inhibitors in reducing losses of nitrogen from fall-application. This occurred in four field experiments. The explanation for this behavior is apparently that inhibitors temporarily slow the amount of available nitrogen released from the soil itself.

NYBORG, M.

Rate of oxidation of elemental sulphur fertilizer

Elemental sulphur fertilizers become available to crops only after they are converted to sulphate by soil bacteria. Elemental sulphur fertilizers are beginning to displace the traditional sulphate-containing fertilizers in treating sulphur-deficient soils in the Prairie Provinces. The purpose of this investigation was fine if spring applied elemental sulphur fertilizers were converted to sulphate quickly enough that annual crops will benefit. The rate of conversion varied greatly with different kinds of elemental sulphur fertilizers. Solid pellets or granules of elemental sulphur gave little or no conversion to the crop-available sulphate within two or three years. That finding was based on field experiments at six locations. At the same locations, finely-divided particles (the size of dust) of elemental sulphur were converted at a speed of 25 to 60% of the application during the first six weeks. However, the fast rate of conversion required that the dusty material be well worked into the soil. While the dusty material is not suitable to handle in farming practice, there was a similar quick conversion with a fertilizer manufactured from finely-divided particles of elemental sulphur held within pellets of urea. The conclusion was that finely-divided particles, whether a dry dust, a liquid emulsion, or held in urea pellets, will supply enough sulphur for annual crops provided the amounts of application of elemental sulphur are at least twice as great as the amounts of sulphur which is recommended with the traditional sulphate fertilizers.

Band placement, rather than mixing into the soil, apparently slowed the conversion of elemental sulphur. Fall or very early spring application, as compared to application at time of seeding, speeded the conversion of elemental sulphur only slightly. However, when soil temperature was high and the particles of elemental sulphur were dust-sized, the rate of conversion for Alberta soils was as great, or greater, than for other soils.

ROBERTSON, J.A.

Available phosphorus in Alberta soils

The objective was to determine the influence of site properties on the response of barley, rapeseed, and wheat to phosphate fertilizer.

Yield and site data from 254 field experiments were assembled. Additional information, including site classification, agro-climatic area, soil zone and soil order, and laboratory analysis of particle size, $CaCO_3$, and organic matter of the surface soils were determined. Three statistical procedures were used to examine the results.

The barley data for 125 site-years indicated that the soil test for phosphorus was the most important site variable. Clay and and $CaCO_3$ content, growing season precipitation, soil pH, organic matter content and site classification were additional variables important in site discrimination or in accounting for the variation in yield increase.

The pooled rapeseed data for 91 site-years indicated that the soil test for phosphorus was the most important site parameter. Other site variables which appeared to be important for site separation did not significantly account for any of the variation in yield increase.

The analysis of the pooled wheat data for 38 site-years indicated that a soil test for phosphorus was the most important site variable. Other significant site properties included organic matter content and electrical conductivity. Site classification did not appear to have a clear influence.

The results of this study need to be verified with external data, but they suggest that the phosphate fertilizer rate for "optimum" yield should decrease as the soil test for phosphorus, soil pH, organic matter content and/or growing season precipitation increase.

ROBERTSON, J.A.

Potassium status of soils in northeastern Alberta

Potassium deficiencies have been reported less frequently than nitrogen, phosphorus and sulphur deficiencies in the prairie provinces. Soil tests reveal, however, that there are significant areas with low levels of available potassium.

Eighteen field experiments were conducted over three years on soils which were low or very low in available potassium. About half the sites were near St. Paul; the others were near Barrhead. The test crop was barley.

Six sites had available potassium levels, in the top 15 cm of soils, less than 40 ug g^{-1} (80 kg/ha). On the average, potassium added at 60 kg/ha increased barley yields about one tonne/ha at these sites but two of the sites showed no response to the potassium fertilizer. Six sites had available potassium levels in the range of 41-80 ug g^{-1} (80-160 kg/ha). On the average potassium increased barley yields about 0.3 tonnes/has at these locations, but three of the sites showed no response to the added fertilizer and two of the sites showed response only when a high amount (300 kg/ha) of potassium was broadcast-incorporated. The six remaining sites had available potassium tests in the range of 80-127 ug g^{-1} (160-250 kg/ha). At these sites there was, on the average, no response to added potassium, yet there was a significant response at one site. These results are similar to those reported by Walker who worked out of the Lacombe Research Station.

It is apparent that the current soil test method is not completely reliable for predicting need for potassium fertilizer. New experiments are underway to assess the carryover of previously added potassium to determine whether potassium is more beneficial for early seeded crops and to assess the effect of the chloride which accompanies potassium in 0-0-60 fertilizer.

INTERDISCIPLINARY

DOMIER, K.W., J.A. ROBERTSON

Fertilizer placement in tilled and untilled soils

There remains considerable uncertainty about the best method of applying phosphorus fertilizers despite considerable research work. Much of that uncertainity stems from the fact that earlier work did not test all the placements which are of current interest. Furthermore, most previous work was short-term, generally one year in duration, which did not permit evaluation of the "residual" phosphorus not absorbed in the year of application. Additionally, many farmers are interested in bulk handling methods prior to seeding rather than the more labour-intensive practice of fertilizing during the seeding operation.

Small plots comparing several fertilizer placements were seeded at three locations on both untilled ("direct-drill") and tilled seed beds. Field-scale plots were seeded on tilled seed beds at two locations. Data have been collected for twelve site-years on the small plots and sixteen site-years on the field-scale plots. Results to date indicated that no one placement of phosphorus fertilizer was clearly superior to all others. Annual broadcast placement appeared to be inferior to other placements while banding away from the seed appeared to be slightly inferior on the average. Treatments using radioactive phosphorus suggested that the greatest recovery of applied phosphorus in the year of application occurred from in-row placement followed closely by mid-row deep-banding of nitrogen plus phosphorus. These studies must be continued for several more years.

NYBORG, M., K.W. DOMIER

Placing fertilizer in bands and nests

In previous work, fall-application was inferior to spring-application for urea, ammonium sulphate, or aqua ammonia fertilizers. The fall application of urea and sulphate ammonia fertilizers was improved slightly by placing the fertilizer in bands and markedly by placing the fertilizers as nests. Nests were made by placing one to three grams of conventional commercial fertilizers at concentrated spots 0.2 to 0.7 meters apart. The reason for this behavior was that the fertilizrs were concentrated in bands or nests and so stopped or slowed the formation of nitrate from the fertilizers. Any losses of fertilizer nitrogen during the winter and early spring happened only to the extent of nitrate formation. In the present work, several factors were investigated in improving the bands or nests. With spacing of bands at 45 cm, compared to 22 cm, the efficiency of urea was increased, especially when the fertilizer was applied late in the fall. The application of bands and nests 10 cm to 12 cm deep usually gave higher crop yields than application at 5 cm deep. Commercial, large pellets of urea, weighing one to three grams per pellet, gave similar results to those obtained with the nests. However, the large pellets were simple to apply in the field. The results confirmed that with fall-application of fertilizers about 10% of the nitrogen in nests or big pellets was lost, but about 50% of the nitrogen was lost when the fertilizer was instead worked into the soil or left on the top of the soil. Banding of fall application gave nitrogen losses from about 10 to 40%.

The use of large pellets for fall-application of nitrogen fertilizers overcomes most of the over-winter and early spring losses, and apparently it is feasible mechanically to apply these large pellets.

UNIVERSITY OF CALGARY

BENN, M.H.

Alsike clover hepatotoxin

The poisoning of horses by Alsike clover has long been recognised, but the causative agent(s) (toxin(s)) remain unknown. Since Alsike clover poisoning of horses is still a problem in the Peace River region of this province, we began a study of the matter: our objectives being to identify the toxin(s), and hopefully to arrive at some useful procedures for treating poisoned animals.

We carried out a phyto-chemical analysis of Alsike clover (supplied by the Fairview Veterinary Laboratory of Alberta Agriculture), paying particular attention to the alkaloidal fraction. We did this because the pathology of the poisoning involves massive liver-damage which recalls that produced by plant-alkaloids of the pyrrolizidine type. Our results indicated that Alsike did contain small amounts of alkaloidal material, which gave color reactions supposedly characteristic of pyrrolizidine alkaloids. However, we were unable to isolate enough of this material to identify individual components. (If these compounds are responsible for the liver damage they must be very potent, since the clover contained them in very small amounts.)

We then decided to attempt to set up a bio-assay procedure involving keeping small mammals (rats, hamsters, rabbits) on a diet containing an Alsike clover extract. However this important work remains to be carried through: something which we plan to do in the Summer of 1983, with other funding.

COSTERTON, J.W.

Bacterial colonization of the surfaces of cells of the digestive tract

A distinct bacterial population in ruminants that had evaded previous researchers because its cells adhere firmly to the tissues of the digestive tract, and are only occasionally found in rumen fluid was discovered. This population is established on the tissue of healthy calves and lambs, during the first few days of life, and it persists on these tissues and makes a very important contribution to the overall physiological functions of the rumen, in that these bacteria digest and "recycle" tissue proteins from squamous epithelium of the rumen wall, protect the fastidious anaerobic bacteria of the rumen by scavenging oxygen, and produce the urease enzyme necessary for normal rumen function. A program at the Agriculture Canada Lethbridge Research Station is presently using some of the more than 2000 isolates of this bacteria to colonize the tissues of newborn lambs in order to promote optimum physiological processes (and early weight gain) and in order to block colonization by the entero-pathogenic strains of *Escherichia coli* that causes "scours".

A major perception comes from this work that has now been found to apply to the bacterial colonization of animal tissues in general. This perception is that animal tissues have a specific surface chemistry that attracts specific series of bacteria to form an adherent population on the tissue surface and that this adherent population contributes cooperative enzymatic functions to the tissue and protects the tissue from colonization by pathogens. The manipulation of this wall-adherent population of bacteria has been shown to enhance early weight gain and provide resistance to scours in newborn lambs. We anticipate that the "seeding" of the digestive tracts of newborn ruminants with beneficial species from this adherent population will soon become a practical means of enhancing early weight gain and promoting resistance to scours.

COSTERTON, J.W.

Evaluation of forage crops by in vitro digestion with rumen bacteria

The Saskatoon and Lethbridge Research Stations of Agriculture Canada have sought to modify alfalfa to develop bloat-safe cultivars of this valuable forage crop. We have studied the digestion of alfalfa and of other bloat-promoting and bloat-safe forage species and concluded that bloat results from a too rapid release of nutrients by means of the bacterial invasion and digestion of forage materials. Now that we understand the microbial basis of pasture bloat, in terms of nutrient release and the nucleation of gas bubbles on bacterially colonized feed particles, we can examine the process of legume digestion in the laboratory using the criteria of weight loss and foam formation, and we have screened hundreds of alfalfa cultivars to select those with slower digestion rates. The speed and convenience of these laboratory digestion studies, in contrast to inconclusive nylon bag experiments and complex feeding trials, has already facilitated the development of partially bloat-safe cultivars.

VETERINARY INFECTIOUS DISEASE ORGANIZATION

ACRES, S.D.

Living vaccine against calf scours caused by enteropathogenic E. coli

Enteropathogenic *E. coli* (EPEC) cause acute, severe, watery scours in calves under five days of age. The pathogenesis of the diarrhea involves colonization of the small intestine of calves by EPEC, a process which involves attachment of the bacteria to the lining of the small intestine. Attachment is mediated by the K99 antigen found on the surface of the bacteria. Initial studies were done to determine whether vaccination against the K99 antigen of EPEC would block this attachment and prevent diarrhea. Pregnant cows were vaccinated with three preparations: 1) purified K99 antigen, 2) K99+ anucleated live *E. coli* (K99+ ALEC), and 3) a formalin-killed whole cell bacterin prepared from a K99+ strain of *E. coli*. At birth, calves were allowed to nurse normally and then were challenge fed a common strain of EPEC at 12-14 hours of age. A group of unvaccinated cows served as controls. The proportion of calves which died of severe watery diarrhea in each of the groups were as follows: purified K99 0/9, K99+ ALEC 1/9, whole cell bacterin 1/9, and non-vaccinated controls 9/10.

Additional studies were done to refine and improve the whole cell bacterin. A strain of EPEC which produced high levels of K99 was selected and culture conditions for optimization of K99 expression were determined. A second vaccine trial was done which demonstrated that vaccine prepared from this strain protected against challenge with two different common strains of EPEC isolated in western Canada. In non-vaccinated control cows 13 out of 19 (68%) of the calves died from diarrhea whereas in vaccinated cows 0 out of 44 (0%) of the calves died. Studies were also done to determine the best time to vaccinate pregnant cows. These showed that optimum antibody titers, and therefore optimum protection, resulted when previously unvaccinated cows were immunized twice. The first injection can be administered anytime after weaning, however, for maximum protection the second injection should be given within 5-7 weeks before calving. During subsequent years good protection is achieved by a single booster injection given 5-7 weeks before calving. These studies contributed to the development of the commercial vaccine VICOGEN, which is manufactured by Connaught Laboratories of Toronto, and which has been available to cattle producers since 1979.

BIGLAND, C.H., E. JANZEN, M. DENSON

Studies of mycoplasmas in bull semen and their transmission in a bull station

Over the period November 1977 to April 1978, three sets of samples of blood and nasal swabs taken from all the bulls at the University of Saskatchewan ROP Bull Testing Station were examined at VIDO. The specimens were tested and cultured to detect the presence of commonly occurring bovine mycoplasma species, particularly *Mycoplasma bovis*. In June 1978, 33 semen samples were also subjected to examination.

Blood serum seriological tests done in November, January and April revealed *Mycoplasma bovis* positive serology present in an average of 66% of the animals at the station. These were distributed among 90% of all the farms represented.

Isolations of mycoplasmas were much lower in number than positive serological tests. The percentage of positive isolations of all types of mycoplasmas were:

November 1977	47.7%
January 1978	24.6%
April 1978	46.6%
June 1978 (semen)	34.8%

Two factors may have contributed to the sharp drop in isolations in January. Mycoplasmas are very temperature sensitive and many may have been chilled beyond recovery in transport to the laboratory. Moreover, 129 bulls which showed signs of respiratory disease on admission to the station, had been treated with antibiotics before the January sampling which could have reduced the chances of successfully culturing the organisms.

Although identifications were only carried out on the 66 isolates from April and June, the following figures were unexpectedly low. The total number identified as *Mycoplasma bovis* was only 7 or 2.2%. *Mycoplasma bovirhinis* was recovered in 19 cases or 5.4%. Seven specimens were found to be negative to tests for both of these types and 33 cultures could not be positively identified due to lack of suitable reagents. No ureaplasmas were isolated.

There was a slight tendency for infection to spread in the pens during the period of confinement, but generally the status of the animals remained the same throughout their six-month stay.

Serological testing showed that mycoplasma infection is very widespread in the cattle population, but culture techniques in this case were not able to demonstrate active infection in a significantly large number of animals.

WESTERN COLLEGE OF VETERINARY MEDICINE

MANNS, J.G.

Bovine infertility; a possible interaction between inflammation and prostaglandins

In preliminary experiments, guinea pigs in the diestrus stage of their cycle were injected into the uterine lumen with E. coli lipopolysaccharide or S. Epidermis. Both treatments resulted in accumulation of leukocytes, particularly macrophages, which were present in a fluid containing high concentrations of prostaglandins of the E and F groups (PGE and PGF). In order to evaluate the source of this prostaglandin, leukocytes of both guinea pig and bovine origin were cultured in vitro; the cells did produce substantial quantities of PGE and PGF when stimulated (eg. by lipopolysaccharide). An experiment was then done to determine if cows with infected uteri (pyometra) have high concentrations of prostaglandins in the uterine fluid. Uterine fluids were obtained from eight clinical cases and an additional nine cases were obtained at an abbatoir. These uterine fluids were very high in PGE and PGF and were similar to uterine fluid concentrations obtained when embryos at day 14 were flushed from sheep. These experiments raise the possibility that retention of the corpus luteum in cases of pyometra may not be due to inability of the uterine epithelium to produce PGF but rather to the large production of PGE by the leukocytes in the uterine lumen thereby creating a situation analogous to pregnancy.

OSBORNE, A.D., J. R. SAUNDERS

Investigation of the pathogenesis of pneumonia resulting from infection by Haemophilus pleuropneumoniae

In studying this respiratory pathogen of swine a method of exposure of pigs to the bacterium resembling that which occurs in nature was derived by the design of an aerosol challenge chamber. Using this it was possible to determine a dose of organisms which could be used later for testing the effect of vaccines in prevention or stress factors in the predisposition to the disease.

Testing of experimental vaccines showed that they failed to prevent the organism producing in the lung although making the disease less severe than in unvaccinated animals.

Results of experiments to test the effect of stress suggested that transport and mixing were more serious than heat as a predisposing cause to the development of clinical disease.

RADOSTITS, O.M.

An in-depth study of neonatal diarrhea of calves

From 1970 to 1982, 2800 calves affected with diarrhea were admitted to the large animal clinic of the Western College of Veterinary Medicine for treatment. These calves provided an opportunity for an in-depth study of the clinical and laboratory aspects of the disease with the objective of determining the etiology of the diarrhea, the pathophysiological changes which occur in affected calves and, evaluating a variety of treatment regimes.

The overall survival rate ws 71.0 percent. Twenty-nine percent of the calves died. Pathological examination of those calves which died revealed a variety of lesions of the intestines and other body systems. Pathologic examination of the intestines of diarrheic calves immediately after death is a very useful diagnostic aid in determining the etiology of the diarrhea particularly in problem herds. The lesions produced by *E. coli, Rotavirus, Coronavirus* and *Cryptosporidia* are specific to each pathogen. To obtain an etiological diagnosis in problem herds it is now recommended that necropsies be done on selected cases of untreated calves early in the course of the disease.

The clinical records of 300 diarrheic calves in 1979 were examined in detail to determine if any clinical abnormality or information in the history of the affected calf would be useful in assessing the prognosis before treatment was begun. A poor prognosis would eliminate the necessity and cost of treatment and affected calves could be euthanitized. The case fatality rate was 29 percent in calves which were known to have ingested colostrum; the case fatality rate was 78 percent in calves with a history of uncertain ingestion of colostrum. However, no one clinical or laboratory finding of the diarrheic was reliable in predicting outcome following treatment. It appeared that diarrheic dehydrated calves must be treated with fluid therapy for at least one day before a reliable prognosis can be made. Special recording forms were developed for obtaining uniform clinical histories of diarrheic calves, uniform clinical and laboratory examinations, and special examinations of calves which do not respond to conventional intensive therapy for several days. This will allow for more effective collection, analysis and interpretation of clinical and laboratory information on a prospective basis.

Many herd outbreaks of diarrhea in beef calves were examined on the farm with the assistance of the diagnostic laboratories of the College. The clinical and laboratory findings include the following: (1) Most outbreaks occur in herds in which crowding of the calving grounds is a major problem. (2) Enterotoxigenic *E. coli* causes diarrhea in calves under three to five days of age. *Rotavirus* and

Coronavirus causes diarrhea in calves from 5 to 25 days of age. *Cryptosporidia* are commonly associated with diarrhea in calves from 10 to 30 days of age and are commonly associated with diarrheic calves which do not respond to prolonged treatment. (3) Outbreaks of diarrhea can usually be controlled by enlarging the calving grounds, the avoidance of calving in contaminated barns and, ensuring that calves receive sufficient colostrum. Weak calves which do not suck voluntarily within two hours after birth should be force fed colostrum using a stomach tube by gravity flow. Very high levels of serum gamma globulin can be achieved in calves using this method. (4) *E. coli* was not identified as the causative agent in problem herds which had vaccinated the pregnant dams with an *E. coli* vaccine (Vicogen). The diarrhea was usually caused by *Rotavirus* and/or *Coronavirus* or *Cryptosporidia*. (5) The calving management system recommended for beef herds (described by O.M. Radostits and S.D. Acres) has been highly successful and is being adopted by many producers. In this system the calving herd is divided into small subunits and cow-calf pairs are moved from the calving grounds when the calf is 24 hours of age to a nursery pasture. This prevents overcrowding in the calving grounds and allows for more effective surveillance of the calving heifers and cows.

Using economic decision analysis the economics of treating the dehydrated diarrheic calf in a veterinary clinic was examined. In 1983 terms, it appears that beef calves must be worth at least $200.00 before it is economical to treat them intensively in a veterinary clinic for a period of up to three days.

An evaluation of the components of therapy of diarrheic calves revealed that oral and parenteral fluid therapy combined with antimicrobials given orally and parenterally resulted in a survival rate of 70 to 84 percent. When no antibiotics were used the survival rate was only 40 percent.

The mean levels of serum protein and gamma globulin were significantly lower in calves which died compared to those which survived.

Calf diarrhea is still a problem for the cattle producer. We can now identify K99+ *E. coli, Rotavirus, Coronavirus* and *Cryptosporidia* from the intestines of diarrheic calves. This multiple etiology makes diagnosis, treatment and control very difficult and unreliable.

The age incidence of diarrhea in calves appears to have changed from a disease of calves under one week of age to one in which calves two to three weeks of age are more commonly affected.

Additional research efforts should be directed towards the epidemiology of the infections which affect calves at two to three weeks of age.

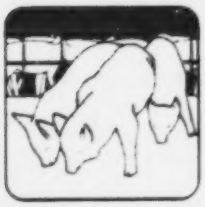
CONTINUING GRANTS

Date following title identifies Annual Report in which project description appears

AGRICULTURAL ENGINEERING

RAPP, E.
Irrigation scheduling for supplemental irrigation in Central and Northern Alberta (1979-1980)

RAPP, E.
Evaluating drainage feasibility of some Alberta soils (1972-1973)



ANIMAL SCIENCE

AHERNE, F.X.
The use of electrolytes and crude immunoglobulins in curing and preventing pre-weaning and post-weaning scours in pigs (1980-1981)

BERG, R.T., M. PRICE, R.T. HARDIN
Strategies for beef cattle improvement (1980-1981)

HARDIN, R.T.
Rate of tissue growth and changes in body composition (1968-1969)

HARDIN, R.T.
Recombination of quantitative traits in sheep (1968-1969)

MILLIGAN, L.P., P.M. KENNEDY
Effects of soluble and bypass protein supplements on intake and utilization of straw (1981-1982)

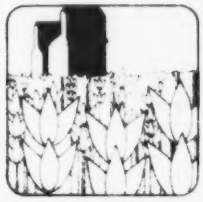
SAUER, W.C.
Lysine requirements of starter pigs (1981-1982)

THOMPSON, J.R., F.X. AHERNE
Etiology of development of leg weakness in swine (1981-1982)

YOUNG, B.A.
Climatic influences on nutrition of cattle (1977-1978)

FOOD SCIENCE

LEMAGUER, M.
Effect of pretreatment on the texture and rehydration properties of air-dried foods (1981-1982)



PLANT SCIENCE

BAILEY, A.W.
A brush control system for controlling aspen forest using herbicide followed by fire (1979-1980)

BAILEY, A.W.
Cattle use of brush on aspen parkland rangeland (1981-1982)

BRIGGS, K.G.
Effects of plant density and competition on selection methods used for the genetic improvement of six row barley (1977-1978)

CLARK, E.A.
Interspecific competition in pastures under continuous and rotational grazing management (1980-1981)

COLOTELO, N.
Role of exudates from aerial mycelium of Sclerotinia sclerotiorum and Fusarium species in pathogenesis (1973-1974)

HIRUKI, C.
Serological and anatomical studies on plant mollicute diseases with special reference to their diagnostic value (1979-1980)

KNOWLES, R.H.
The behaviour of turfgrass growing on minimal medium in response to irrigation and nutritional inputs (1980-1981)

KONDRA, Z.P.
Evaluation of genetic variability in breeders' seed of licensed varieties and advanced selections of rape (B. napus L.) (1977-1978)

KONDRA, Z.P.
Evaluation of synthetic varieties for the exploitation of hybrid vigor in rapeseed (1981-1982)

VANDEN BORN, W.H.
Biology and control of cleavers (Galium aparine) (1981-1982)

RURAL ECONOMY

HAWKINS, M.H., M.M. VEEMAN
Market innovations and price behaviour — Alberta hogs (1980-1981)

LEROHL, M.L., M.H. HAWKINS
Canadian grade standards for wheat and export market potential (1978-1979)

MANNING, T.W.
The potential impact of rising energy prices on the use and allocation of resources in grain production (1980-1981)

NORBY, R.R., M.H. HAWKINS
Meat price relationships — farm, wholesale and retail (1980 -1981)

PETERSON, T.A.
Analysis of farm leases and rental arrangements in Alberta (1980-1981)

PETERSEN, T.A.
The economics of continuous cropping in the dark brown soil zone of Alberta (1980-1981)

RICHTER, J.J.
The European agricultural export subsidy and the prospect of the Canadian grain trade (1981-1982)

SCHULTZ, W.M.
Financial planning models for Alberta farms (1981-1982)

SOIL SCIENCE

COOK, F.D.
Inoculum for pulses (1979-1980)

MacHARDY, F.V.
Assessment of nitrogen contribution to cereals by intercropping with annual legumes (1977-1978)

MacHARDY, F.V., F.D. COOK
Measurement of photosynthate requirement for nitrogen fixation by selected free-living microorganisms found in Alberta soils (1977-1978)

McGILL, W.B.
Acid phosphatase production in relation to plant-available P (1981-1982)

PLUTH, D.J.
Productivity ratings for soil types in Edson and Whitecourt map areas (1968-1969)

PLUTH, D.J.
Nutrient distribution and cycling in selected forest ecosystems (1968-1969)

WEBSTER, G.R.
Testing of a revised soil-moisture budget (1978-1979)

INTERDISCIPLINARY

ANDREW, W.T., K.W. DOMIER
The integration of seed pieces, cutters and planters for better plant stands in potato fields (1977-1978)

ANDREW, W.T., K.W. DOMIER
A systematic study of potato cutters, seed pieces and planters (1980-1981)

BERG, R.T., Z.J. HAWRYSH, M.A. PRICE
Assessment of optimum slaughter weight and condition in beef cattle (1979-1980)

CLEGG, L.F.L., W.T. ANDREW
Fertilizer and trace element studies (1974-1975)

UNIVERSITY OF BRITISH COLUMBIA

COPEMAN, R.J.

Serological detection methods for Corynebacterium sepedonicum (1977-1978)

WESTERN COLLEGE OF VETERINARY MEDICINE

FORSYTH, G.W.

Control of intestinal secretion in Colibacillosis in pigs (1978-1979)

GUDMUNDSON, J., M.E. SMART

A survey of trace mineral metabolism in purebred and percentage simmental cattle (1978-1979)

MAPLETOFT, R.J.

Induction of abortion in feedlot heifers (1979-1980)

MURPHY, B.D.

Improving embryo survival in mink (1981-1982)

POLLEY, L.R.

A necropsy study of the occurrence of selected helminth parasitisms among horses in western Canada (1979-1980)

RAWLINGS, N.C.

The endocrinology and physiology of blastocyst implantation in the ewe (1978-1979)

STOCKDALE, P.H.G.

Immunological control of shipping fever in cattle (1979-1980)

ANIMAL SCIENCE

AHERNE, F.X., R. BLAIR

Canola meal for starter and grower pigs — a collaborative study

To conduct collaborative work to clarify the maximum levels of Canola meal that can be included in starter and grower pig diets. At present, precise recommendations cannot be made in view of a lack of agreement between experiments. It is detrimental to both the export of Canola meal and its domestic utilization that confusion and controversy exist regarding recommended levels of inclusion in swine diets. It is therefore in the best interests of the Canola industry, Canola producers and the feed industry using CM that research establish guidelines as to the proper usage levels in the diets of young pigs.

BERG, R.T.

Influence of selection for growth on maternal traits in mice

The objective of this project is to evaluate the maternal influence on fetal litter size and birth weight, and on preweaning and postweaning performance in several different lines of mice. We would quantify to what extent has prior selection for a rapid growing, large mature body-weight animal had on influencing lactation, appetite and overall efficiency. Mice will be used as a model for swine breeding since they represent a much more rapid and inexpensive means of looking at these commercially important traits. This same criterion for selection has been practiced for many generations in beef cattle and swine breeding programs. Thus the influence of these traits on subsequent performance and on future selection and improvement schemes in animal breeding is of major economic importance to the agriculture industry.

MILLIGAN, L.P., P. KENNEDY

Methods of protection of canola meal

As a follow-up to our previously received April 1981 AART grant "Effects of soluble and bypass protein supplements on intake and utilization of straw", the proposed project would be to seek alternative ways of protecting canola meal from rapid ruminal degradation. An effective method of protection would allow an increased amino acid supply to, and absorption of amino acids from, the small intestine. Such protection has been shown to result in significant increases in the rate of live-weight gain of steers given barley straw.

PRICE, M.

The use of growth stimulating anabolic agents in beef production from young bulls and cull cows

Most research on anabolic growth promoting agents has been conducted on steers. Our research program is placing increased emphasis on the role of cull cow/heifers and young bulls as sources of fed beef. A common question is: would implanting these cows and bulls further increase their productivity, and if so, under what conditions. We need to conduct research to inform the beef industry on these timely questions.

SHIRES, A.

Effects of variable levels of dietary protein and energy, and periods of feeding on the rate of growth and carcass composition of meat-type chickens

The rearing of commercial strains of broiler chickens to roaster weight (3.2 kg) on dietary regimens designed to promote rapid growth is not profitable due to the increase in the incidence of leg disorders and mortality after nine weeks of age and to the decrease in carcass quality. It is proposed to develop feeding programs for the production of roasters which minimize losses due to leg disorders and mortality and thus increase monetary returns. It is also proposed to study the effect of different feeding programs on the carcass composition of roasting chickens.

FOOD SCIENCE

HADZIYEV, D.

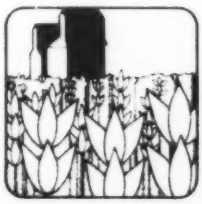
Storage conditioning of potato granules for the snack food industry

Freshly processed potato granules, when reconstituted, absorb much water. Optimum water uptake for snack food granules occurs after the granules are aged for one year. The goal of this project is for one year's equivalent aging to occur within one to three weeks. Thus, granule production for domestic and export markets, aimed at the snack food industry, could be substantially increased.

OORAIKUL, B.

Dehydration of vegetables: Improvement in drying rate, textural properties and rehydration characteristics of the products through physical and chemical pre-treatments

The objectives of this study are to reduce energy consumption in the dehydration of vegetable products, and to improve textural and rehydration characteristics, and hence acceptability, of the products by physical and chemical pretreatments.



PLANT SCIENCE

HIRUKI, C.

Evaluation and development of practical diagnostic procedures for potato spindle tuber viroid disease in Alberta

The potato spindle tuber disease in western Canada, Alberta in particular, remains to be a serious threat to our potato industry because of the facts that the disease agent, a new class of low molecular weight infectious ribonucleic acid called viroid, is easily transmitted through vegetative propagation, foliar contact, pollen and true seed, causing considerable quality and yield reduction of potato tubers. Exclusion of the viroid from seed potatoes has been extremely difficult due to the lack of effective diagnostic procedures. Usual virus testing methods are unapplicable because of the unique nature of the pathogen. This project aims at the development of reliable and practical methods for rapid mass-testing of potato spindle tuber viroid in potatoes.

SOIL SCIENCE

ROBERTSON, J.A.

Factors affecting potassium availability in central Alberta soils

The objective of this project is to assess the effect of some soil variables on the response of crops to added potassium.

According to summaries of soil test results for extractable K, there are large areas of K-deficient soils in the part of central Alberta north of Highway 16. Yet we observed in a project, which is now just being concluded, that the response of barley to added potassium was not predicted well by the soil test value alone. In order to improve the predictive value of the soil test it is necessary to assess the soil factors which influence its interpretation.

INTERDISCIPLINARY

ROBERTSON, J.A., K.W. DOMIER

Factors affecting P fertilizer utilization in tilled and untilled soils

To study the effect on P fertilizer utilization of the following factors: placement of the P fertilizer with respect to the seed; placement of N fertilizer with respect to the P fertilizer; form (solid vs solution) of fertilizer; time of application (fall vs spring); tillage (tilled vs direct drill), and residual effects of previously applied P fertilizers.

Traditionally, P fertilizers have been applied in the seed row while high applications of N have been broadcast. Recent work challenges both of these practices. Some workers have shown that infrequent, higher rates of P fertilizers broadcast on the soil can be quite satisfactory. Other workers are recommending "deep-banding" of P fertilizers. Farmers are seeking less labour-intensive methods of applying P fertilizers and are very interested in the efficiency of these newer recommendations. Several workers have demonstrated that N fertilizer utilization can be higher when band applications are used rather than broadcast applications. Further, there is evidence to suggest that P fertilizer utilization is increased when N fertilizer is banded with it. Direct-drill seeding presents special problems since most equipment available limits application to in-the-row or broadcast methods.

WESTERN COLLEGE OF VETERINARY MEDICINE

CRICHLOW, E.

Forestomach mechanism mediating rumen stasis in lactic acidosis

'Grain overload' is a disease of economic importance to the livestock industry since it occurs most readily in cattle being prepared for market. Although the severity of the disease depends, in part, on the ensuing loss of forestomach motility, little is known about the mechanism which mediates this important feature. In view of this lack of information, the objective of this project will be to determine whether rumen fluid obtained during loss of reticulo-ruminal motility in 'grain overload' sheep can excite forestomach acid-sensitive epithelial receptors. And if so, is this activation brought about by the levels of undissociated volatile fatty acids existing in the rumen fluids.

Since it has been established that excitation of forestomach acid-sensitive epithelial receptors will cause inhibition of reticulo-ruminal contractions, information obtained in this project will provide evidence of a mechanism whereby loss of forestomach motility in 'grain overload', this information may also be useful in developing effective therapy.

MAPLETOFT, R.J., W.H. JOHNSON

Factors affecting survival of bovine embryos in low temperature storage

(1) Improve the utilization of embryo transfer by cattle breeders.
(2) Improve Canada's competitive advantage in the exportation of genetic material.
(3) Improve pregnancy rates following transfer of frozen-thawed bovine embryos.
(4) Compare various specific factors in the freeze-thaw cycle of bovine embryos.

The procedure utilized in the freezing of bovine embryos has evolved from that used in the freezing of semen and mouse embryos. Our laboratory along with a number of other laboratories in North America has been very busy studying the various factors that may affect the survival of frozen-thawed bovine embryos. However, results are still less than satisfactory. In order to maximize results and to ensure wide use of embryo freezing techniques, we feel that the following factors require immediate investigation:

(a) Cryoprotectant (glycerol vs DMSO),
(b) thawing rates (30 degrees vs 20 degrees celsius),
(c) freezing container (straw vs vial).

RAWLINGS, N.

The development and application of controlled breeding and artifical insemination in sheep

Since the War years the sheep industry in western Canada and, in fact in North America, has been in a state of decline. This decline has been accompanied by a parallel fall-off in the level of technical support, supporting and dependent industries and by a lack of innovation. At present the industry is experiencing an expansion phase, accompanied by an increase in enthusiasm and a real requirement for updating in production and marketing technologies. Recently, within the Western College of Veterinary Medicine, more emphasis has been placed on sheep research, especially in the area of basic and applied studies of reproduction. Our programme is funded from various sources, with specific funds directed to individual aspects of our research effort. We have a large field trial in which we are applying, testing and developing new techniques in controlled breeding in a commercial environment. We have one of the few remaining University research flocks, in which we are investigating problems involved in controlled reproduction and developing new techniques in more controlled environments. We are also conducting basic studies into the endocrine control of oestrus and ovulation in the ewe and their seasonality. The purpose of the present application is to seek funds to support basic and applied studies on the usefulness of combined oestrus synchronisation and artificial insemination with fresh extended semen in the ewe throughout the year.

SEARCY, G.

Investigation of anemia, microcytosis and poikilocytosis in calves

Within the past decade a red-cell disorder has been recognized in calves at the Western College of Veterinary Medicine characterized by mild anemia, microcytosis and poikilocytosis. The objective of this project is to attempt to gain a better understanding of the etiology and pathogenesis of this disorder. The anemia causes decreased growth rate and unthriftiness during calves' rapid growth phase.

CONTRIBUTIONS
from sources listed are gratefully acknowledged
April 1, 1982-March 31, 1983

Alberta Broiler Growers Marketing Board
Alberta Pork Producers Marketing Board
Alberta Potato Commission
Alberta Wheat Pool
Beefbooster Ltd.
Burns Meats Ltd. (Vigor Feeds)
Canadian Mink Breeders Association
Gem Sod Farms Ltd.
Hannas Seeds Ltd.
Imperial Oil Ltd.
Lilydale Co-operative Ltd.
Lofts Seeds Inc.
Masterfeeds/Maple Leaf Mills Ltd.
Northrup King Seeds Ltd.
Oseco Inc.
Otto Pick and Sons Seeds Ltd.
Potash and Phosphate Institute
Potash Corporation of Saskatchewan
Prairie Seeds Ltd.
Rothwell Seeds Ltd.
Shur-Gain Division, Canada Packers Ltd.
United Feeds — United Grain Growers
University of Saskatchewan
University of Saskatchewan — Horned Cattle Trust
Vauxhall Foods Ltd.
Western Co-operative Fertilizers Ltd.

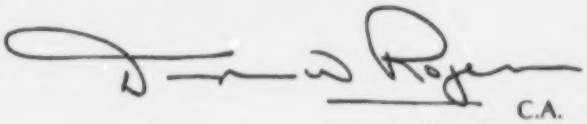
ALBERTA AGRICULTURAL RESEARCH TRUST
FINANCIAL STATEMENTS
MARCH 31, 1983

AUDITOR'S REPORT

To the Trustees of the
Alberta Agricultural Research Trust

I have examined the balance sheet of the Alberta Agricultural Research Trust as at March 31, 1983 and the statement of revenue, expenditure and unexpended funds for the year then ended. My examination was made in accordance with generally accepted auditing standards, and accordingly included such tests and other procedures as I considered necessary in the circumstances.

In my opinion, these financial statements present fairly the financial position of the Trust as at March 31, 1983 and the results of its operations for the year then ended in accordance with generally accepted accounting principles applied on a basis consistent with that of the preceding year.



C.A.
Auditor General

Edmonton, Alberta
August 31, 1983

Statement A

ALBERTA AGRICULTURAL RESEARCH TRUST
BALANCE SHEET
AS AT MARCH 31, 1983

	1983	*1982*
ASSETS		
Current:		
Deposits in trust (Note 3)	$249,185	$ 64,827
LIABILITIES		
Research grants payable	$143,567	$ -
Unexpended funds, Statement B	105,618	64,827
	$249,185	$ 64,827

The accompanying notes are part of these financial statements.

ALBERTA AGRICULTURAL RESEARCH TRUST
STATEMENT OF REVENUE, EXPENDITURE AND UNEXPENDED FUNDS
FOR THE YEAR ENDED MARCH 31, 1983

	1983	*1982*
REVENUE		
Contributions from the Province of Alberta, Department of Agriculture	$250,000	$255,000
Contributions from industry	137,685	135,000
Interest	31,367	29,953
	419,052	419,953
EXPENDITURE		
Research grants	355,072	361,040
Administration charge	23,189	23,205
	378,261	384,245
Excess of revenue over expenditure	40,791	35,708
Unexpended funds at beginning of year	64,827	29,119
Unexpended funds at end of year	$105,618	$ 64,827

ALBERTA AGRICULTURAL RESEARCH TRUST
NOTES TO THE FINANCIAL STATEMENTS
MARCH 31, 1983

Note 1 Authority

The Alberta Agricultural Research Trust operates under the authority of the Alberta Agricultural Research Trust Act, Chapter A-14, Revised Statutes of Alberta 1980.

Note 2 Significant Accounting Policies

General

Research grants are recorded in these financial statements when approved for payment to researchers' accounts. Unexpended balances of grant funds held in researchers' accounts are not reflected in these financial statements.

Changes in Financial Position

A statement of changes in financial position is not provided as disclosure in these financial statements is considered to be adequate.

Note 3 Deposits in Trust

Deposits in trust consist of deposits in the Consolidated Cash Investment Trust Fund of the Province of Alberta.

Note 4 Approval of Financial Statements

These financial statements were approved by management on August 31, 1983.